

## CLAIMS

1. An image sensor comprising a plurality of pixels, each pixel comprising:  
a light sensor element (12), a sensor voltage across the element  
5 varying depending on the light incident on the element (12);  
a voltage amplifier (16) having gain greater than 1; and  
a sampling capacitor (18) charged by the voltage amplifier.
2. An image sensor as claimed in claim 1, wherein each pixel further  
10 comprises a pixel storage capacitor (14) connected to the light sensor element  
(12).
3. An image sensor as claimed in claim 2, wherein the capacitance of the  
sampling capacitor (18) is less than 10 times the capacitance of the pixel  
15 storage capacitor (14).
4. An image sensor as claimed in claim 3, wherein the capacitance of the  
sampling capacitor (18) is less than 2 times the capacitance of the pixel  
storage capacitor (14).  
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5. An image sensor as claimed in claim 4, wherein the capacitance of the  
sampling capacitor (18) is approximately equal to the capacitance of the pixel  
storage capacitor (14).
- 25 6. An image sensor as claimed in claim 3, 4 or 5, wherein the capacitance  
of the sampling capacitor (18) is in the range 0.5pF to 3pF, and the  
capacitance of the pixel storage capacitor (14) is in the range 0.5pF to 3pF.
7. An image sensor as claimed in claim 1, wherein the capacitance of the  
30 sampling capacitor (18) is less than 10 times a self-capacitance of the light  
sensor element (12).

8. An image sensor as claimed in claim 7, wherein the capacitance of the sampling capacitor (18) is less than 2 times the self-capacitance of the light sensor element (12).
- 5 9. An image sensor as claimed in claim 7 or 8, wherein the capacitance of the sampling capacitor (18) is in the range 0.5pF to 3pF, and the self-capacitance of light sensor (12) is in the range 0.5pF to 3pF.
- 10 10. An image sensor as claimed in any preceding claim, wherein the gain of the voltage amplifier (16) is in the range 2 to 5.
11. An image sensor as claimed in any preceding claim, wherein the voltage amplifier (16) comprises first (38) and second (40) transistors in series ~~between~~ power lines (15), the light sensor element (12) being connected to the  
15 gate of one of the transistors (40), and a bias voltage (44) being connected to the gate of the other transistor (38), the output of the voltage amplifier (16) being defined at the connection between the first and second transistors (38,40).
- 20 12. An image sensor as claimed in claim 11, wherein the output of the voltage amplifier (16) is connected to one terminal of the sampling capacitor (18), the other terminal of the sampling capacitor (18) being connected to the ~~pixel~~ output through an output switch (22;34).
- 25 13. An image sensor as claimed in any preceding claim wherein each pixel ~~further~~ comprises an input switch (20;30) for applying a fixed potential ( $V_{reset}$ ) ~~across~~ the light sensor element.
- 30 14. A method of measuring light intensity of an image to be detected using a plurality of light sensor elements (12) each forming a pixel of an image sensor, a sensor voltage ( $V_{in}$ ) across the elements varying depending on the light incident on the elements, the method comprising:

amplifying the sensor voltage ( $V_{in}$ ) using an in-pixel voltage amplifier (16) having a gain greater than 1;

charging a sampling capacitor (18) with the amplified voltage ( $V_{out}$ ) and measuring the flow of charge required to charge the sampling capacitor (18).

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15. A method as claimed in claim 14, wherein a reset operation is carried out before amplifying the sensor voltage ( $V_{in}$ ), the reset operation comprising applying a known potential to one terminal of the sampling capacitor (18) and applying a known potential ( $V_{reset}$ ) across the sensor element, the amplified  
10 voltage ( $V_{out}$ ) being subsequently applied to the other terminal of the sampling capacitor (18).

16. A method as claimed in claim 14 or 15, wherein the capacitance of the sampling capacitor (18) is less than 10 times the capacitance of a pixel storage  
15 capacitor (14) of the pixel.

17. A method as claimed in claim 16, wherein the capacitance of the sampling capacitor (18) is less than 2 times the capacitance of the pixel storage capacitor (14).  
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18. A method as claimed in claim 17, wherein the capacitance of the sampling capacitor (18) is approximately equal to the capacitance of the pixel storage capacitor (14).

25 19. A method as claimed in any one of claims 12 to 16, wherein the gain of the voltage amplifier (16) is in the range 2 to 5.